

# 6N135/6N136

## General Purpose Type Photocoupler

### ■ Features

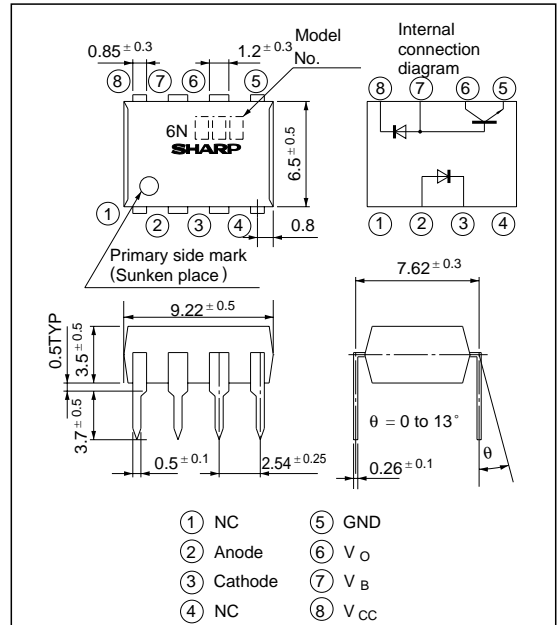
- High speed response  $t_{PHL}$ ,  $t_{PLH}$   
(6N135 : MAX.  $1.5 \mu s$  at  $R_L = 4.1k\Omega$ )  
(6N136 : MAX.  $0.8 \mu s$  at  $R_L = 1.9k\Omega$ )
- High common mode rejection voltage  
( $CM_H$  : TYP.  $1kV/\mu s$ )
- Standard dual-in-line package
- Recognized by UL, file No. E64380

### ■ Applications

- Computers, measuring instruments, control equipment
- High speed line receivers, high speed logic
- Telephone sets
- Signal transmission between circuits of different potentials and impedances

### ■ Outline Dimensions

(Unit : mm)



### ■ Absolute Maximum Ratings (Ta = 25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	$I_F$	25	mA
	*1 Peak forward current	$I_F$	50	mA
	*2 Peak transient forward current	$I_{FM}$	1	A
	Reverse voltage	$V_R$	5	V
	Power dissipation	P	45	mW
Output	Supply voltage	$V_{CC}$	- 0.5 to + 15	V
	Output voltage	$V_O$	- 0.5 to + 15	V
	Emitter-base reverse withstand voltage (Pin 5 to 7)	$V_{EBO}$	5	V
	Average output current	$I_O$	8	mA
	Peak output current	$I_{OP}$	16	mA
	Base current (Pin 7)	$I_B$	5	mA
	Power dissipation	$P_O$	100	mW
*3 Isolation voltage	$V_{iso}$	2 500	$V_{rms}$	
Operating temperature	$T_{opr}$	- 55 to + 100	°C	
Storage temperature	$T_{stg}$	- 55 to + 125	°C	
*4 Soldering temperature	$T_{sol}$	260	°C	

\*1 50% duty cycle, Pulse width : 1 ms  
 Decreases at the rate of  $1.6mA/°C$  if the external temperature is  $70°C$  or more.

\*2 Pulse width  $\leq 1 \mu s$ , 300 p/s

\*3 40 to 60% RH, AC for 1 minute

\*4 For 10 seconds

\* "OPIC" (Optical IC) is a trademark of the SHARP Corporation.

An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.

### ■ Electro-optical Characteristics

( Ta = 0 to + 70 °C unless otherwise specified )

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	
*5 Current transfer ratio	<b>6N135</b>	CTR(1)	Ta = 25 °C, IF = 16mA	7.0	40	-	%
	<b>6N136</b>	CTR(1)		19	40	-	%
	<b>6N135</b>	CTR(2)	IF = 16mA, VO = 0.5V	5.0	43	-	%
	<b>6N136</b>	CTR(2)	VCC = 4.5V	15	43	-	%
Logic (0) output voltage	VOL	*7IF = 16mA, VCC = 4.5V	-	0.1	0.4	V	
Logic (1) output current	IOH(1)	Ta = 25 °C, IF = 0 VCC = VO = 5.5V	-	3.0	500	nA	
	IOH(2)	Ta = 25 °C, IF = 0 VCC = VO = 15V	-	0.01	1.0	μA	
	IOH(3)	IF = 0, VCC = VO = 15V	-	-	50	μA	
Logic (0) supply current	ICCL	IF = 16mA, VCC = 15V VO = open	-	200	-	μA	
Logic (1) supply current	ICCH(1)	Ta = 25 °C, VCC = 15V VF = open, IO = 0	-	0.02	1.0	μA	
	ICCH(2)	VCC = 15V VO = open, IF = 0	-	-	2.0	μA	
Input forward voltage	VF	Ta = 25 °C, IF = 16mA	-	1.7	1.95	V	
Input forward voltage temperature coefficient	ΔVF/ΔTa	IF = 16mA	-	-1.9	-	mV/°C	
Input reverse voltage	BVR	Ta = 25 °C, IR = 10 μA	5.0	-	-	V	
Input capacitance	CIN	VF = 0, f = 1MHz	-	60	-	pF	
*6 Leak current (input-output )	II-O	Ta = 25 °C, 45 % RH, t = 5s VI-O = 3kVDC	-	-	1.0	μA	
*6 Isolation resistance (input-output )	RI-O	VI-O = 500VDC	-	10 <sup>12</sup>	-	Ω	
*6 Capacitance (input-output )	CI-O	f = 1MHz	-	0.6	-	pF	
Transistor current amplification factor	hFE	VO = 5V, IO = 3mA	-	70	-		

\*5 Current transfer ratio is the ratio of input current and output current expressed in % .

\*6 Measured as 2-pin element ( Short 1, 2, 3, 4 )

\*7 **6N135** : IO = 1.1mA, **6N136** : IO = 2.4mA

Note ) Typical value : at Ta = 25 °C

## ■ Switching Characteristics

( $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$ ,  $I_F = 16\text{mA}$ )

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
*8 Propagation delay time Output (1)→(0)	<b>6N135</b> $t_{PHL}$	$R_L = 4.1\text{k}\Omega$	-	0.3	1.5	$\mu\text{s}$
	<b>6N136</b> $t_{PHL}$	$R_L = 1.9\text{k}\Omega$	-	0.3	0.8	$\mu\text{s}$
*8 Propagation delay time Output (0)→(1)	<b>6N135</b> $t_{PLH}$	$R_L = 4.1\text{k}\Omega$	-	0.4	1.5	$\mu\text{s}$
	<b>6N136</b> $t_{PLH}$	$R_L = 1.9\text{k}\Omega$	-	0.3	0.8	$\mu\text{s}$
*10,11 Instantaneous common mode rejection voltage “output (1)”	$CM_H$	*12 $I_F = 0$ , $V_{CM} = 10V_{P-P}$	-	1 000	-	$V/\mu\text{s}$
*10,11 Instantaneous common mode rejection voltage “output (0)”	$CM_L$	*12 $V_{CM} = 10V_{P-P}$ , $I_F = 16\text{mA}$	-	- 1 000	-	$V/\mu\text{s}$
*13 Bandwidth	BW	$R_L = 100\Omega$	-	2.0	-	MHz

\*8  $R_L = 4.1\text{k}\Omega$  is equivalent to one LSTTL and  $6.1\text{k}\Omega$  pull-up resistor.  $R_L = 1.9\text{k}\Omega$  is equivalent to one TTL and  $5.6\text{k}\Omega$  pull-up resistor.

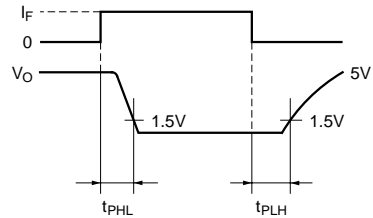
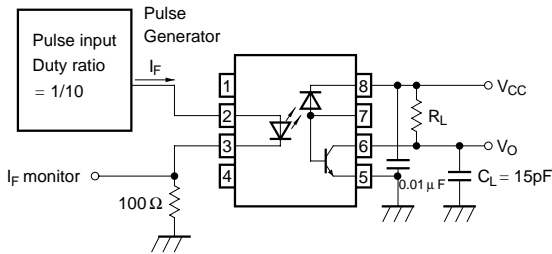
\*10 Instantaneous common mode rejection voltage “output (1)” represents a common mode voltage variation that can hold the output above (1) level ( $V_O > 2.0\text{V}$ ).

Instantaneous common mode rejection voltage “output (0)” represents a common mode voltage variation that can hold the output above (0) level ( $V_O < 0.8\text{V}$ ).

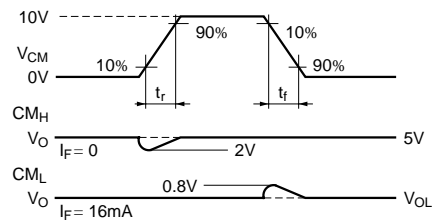
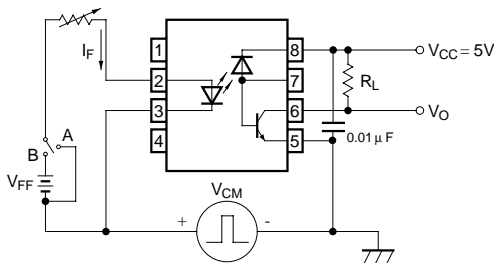
\*12 **6N135**:  $R_L = 4.1\text{k}\Omega$  **6N136**:  $R_L = 1.9\text{k}\Omega$

\*13 Bandwidth represents a point where AC input goes down by 3dB.

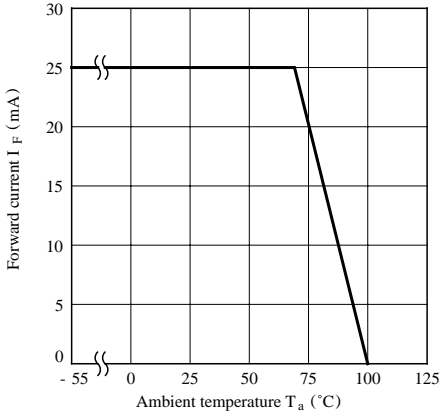
### \*9 Test Circuit for Propagation Delay Time



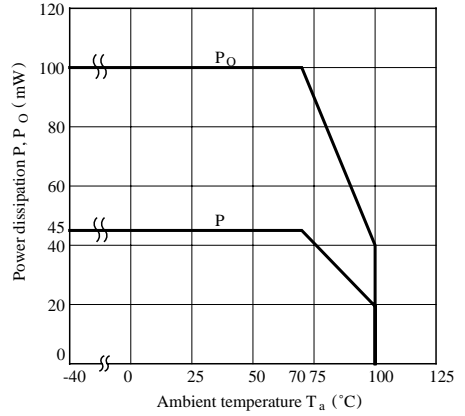
### \*11 Test Circuit for Instantaneous Common Mode Rejection Voltage



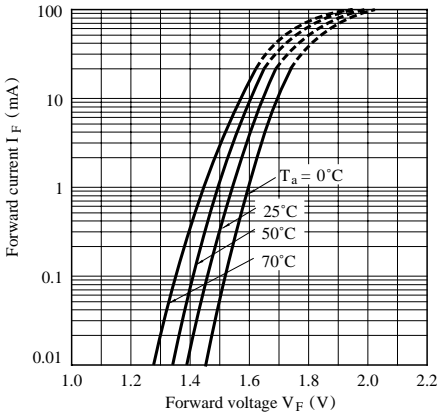
**Fig. 1 Forward Current vs. Ambient Temperature**



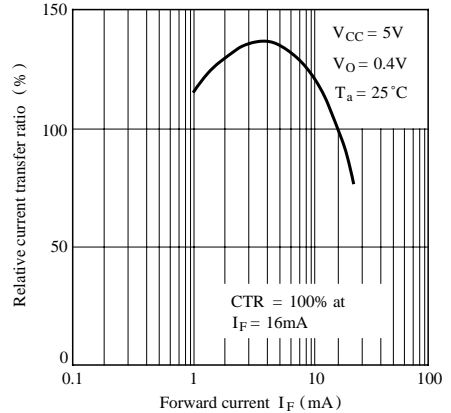
**Fig. 2 Power Dissipation vs. Ambient Temperature**



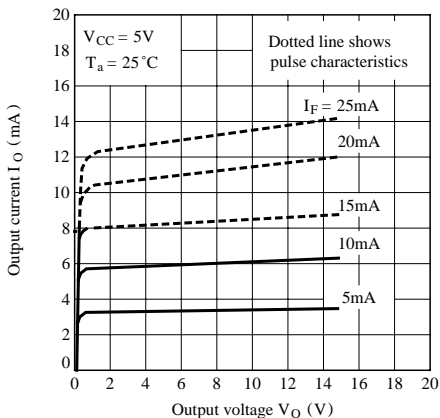
**Fig. 3 Forward Current vs. Forward Voltage**



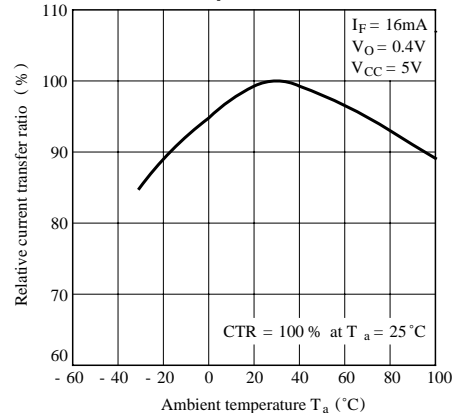
**Fig. 4 Relative Current Transfer Ratio vs. Forward Current**



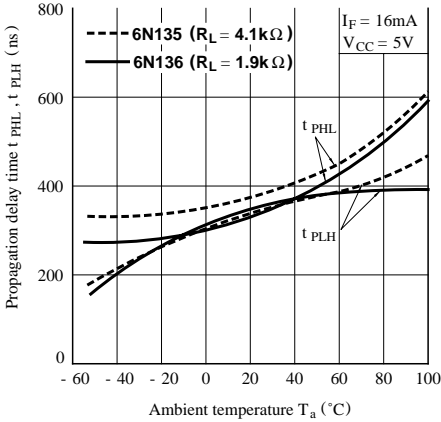
**Fig. 5 Output Current vs. Output Voltage**



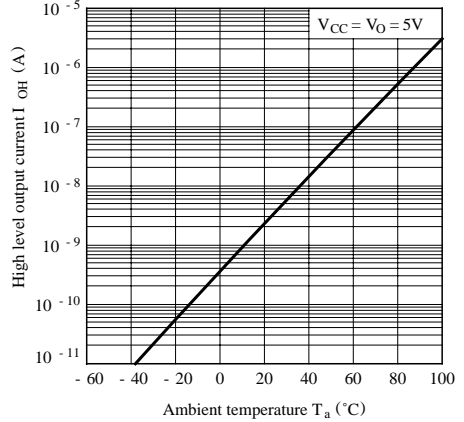
**Fig. 6 Relative Current Transfer Ratio vs. Ambient Temperature**



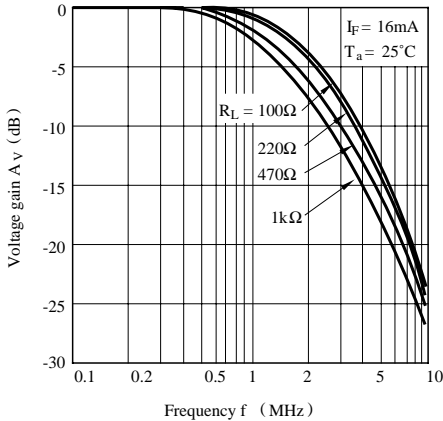
**Fig. 7 Propagation Delay Time vs. Ambient Temperature**



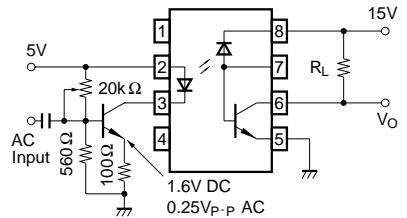
**Fig. 8 High Level Output Current vs. Ambient Temperature**



**Fig. 9 Frequency Response**



**Test Circuit for Frequency Characteristic**



**■ Precautions for Use**

- (1) It is recommended that a by-pass capacitor of more than 0.01μ F be added between V<sub>CC</sub> and GND near the device in order to stabilize power supply line.
- (2) Transistor of detector side in bipolar configuration is apt to be affected by static electricity for its minute design. When handling them, general counterplan against static electricity should be taken to avoid breakdown of devices or degradation of characteristics.
- As for other general cautions, please refer to the chapter “ Precautions for Use ” .  
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